International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2024: 2.102

Evaluation Of Curcumin Chip and Tetracycline Fibers as Adjunct to Scaling and Root Planning - A Clinical Study

Sanjana J.[1], Sai Sri Soury G.[2], Ravishankar P. L.[3], Murali Venkata Rama Mohan Kodali[4], Priyankar Chakraborty[5], Subhashini B.[6]

[1]Department of Periodontology, SRM Kattankulathur Dental College and Hospital, Potheri - Tamilnadu, India – 603203
Email: *sj0112[at]srmist.edu.in*
Orcid id: 0009 - 0004 - 4217 - 820X

[2]Department of Periodontology, SRM Kattankulathur Dental College and Hospital, Potheri - Tamilnadu, India – 603203
Email: *sg9098[at]srmist.edu.in*
Orcid id: 0009 - 0004 - 1585 - 6909

[3]Department of Periodontology, SRM Kattankulathur Dental College & Hospital, Potheri - Tamilnadu, India – 603203
Corresponding Author Email: *ravishak[at]srmist.edu.in*
Orcid: 0000 - 0001 - 5955 - 8162

[4]Associate Professor, Department of Oral and Maxillofacial Surgery, College of Dentistry, King Faisal University - 31982, Al Ahsa - Kingdom of Saudi Arabia.

[5]Assistant Professor, Department of Periodontology, Agartala Government Dental College & IGM Hospital, IGM Chowmuhani, Agartala - 799001
Email: *cpriyankar65[at]gmail.com*
ORCID: 0000 - 0002 - 1481 - 3155

[6]Department of Periodontology, SRM Kattankulathur Dental College and Hospital, Potheri - Tamilnadu, India – 603203
Email: *sb8143[at]srmist.edu.in*
Orcid id: 0009 - 0005 - 9608 - 5911

Abstract: ***Aim: To evaluate the efficacy of the adjunctive use of curcumin chip with scaling/root planing as compared with tetracycline fibers with scaling/root planing in the treatment of the chronic periodontitis. Material and Methods: This study was involving fifteen patients (9 males and 6 females), each exhibiting localized chronic periodontitis across 45 sites with persistent periodontal pockets characterized by probing depths of ≥5 mm and bleeding on probing. Participants were randomly allocated to three treatment groups: one group received scaling and root planing exclusively, while the other two groups received scaling and root planing combined with curcumin chip and tetracycline fibers respectively. Clinical parameters were recorded at baseline and at 1 month, 3 months and 6 months post - treatment. Results: All patients exhibited significant improvements in plaque and gingival index scores. Additionally, probing depth and Clinical Attachment Level (CAL) showed significant enhancements across all groups. However, the administration of curcumin chips yielded the most favourable results. Conclusion: Although meticulous scaling and root planing are effective for managing periodontal pockets, the adjunctive use of locally delivered curcumin showed better outcomes than tetracycline comparatively.***

Keywords: Curcumin chip, Tetracycline fibers, Local drug delivery, Periodontal pocket.

1. Introduction

Periodontitis is an infectious, inflammatory condition that affects the supporting structures of the teeth. It arises from intricate interactions between the microbial biofilm and the host's immune - inflammatory response, leading to disturbances in bone and connective tissue homeostasis. The onset of periodontal disease is determined by this imbalance between the virulence of the bacteria and the ability of the host to defend itself [(1).]

Traditionally, the main goal of periodontal therapy has been to mechanically remove bacteria in order to reduce infection. Although scaling and root planing (SP) is still considered the "gold standard, " it may not always be able to prevent or reduce anaerobic infections at the base of the pocket, in accessible areas like furcations, and in gingival tissues and structures that are difficult to reach with periodontal instruments, especially at sites where the probing depth (PD) is more than 5 mm [(2).]

Systemic antibiotics aim to reduce subgingival microflora but are often accompanied by side effects. To address this issue, local delivery systems have been developed to administer antibiotic or antiseptic agents directly to the disease site, minimizing systemic effects. The effective locally delivered agents most commonly used in the periodontal disease include Tetracycline fibers, 10% Doxycycline, 2% Minocycline, Chlorhexidine gluconate and Metronidazole, although none are completely free of side effects [(3).]

Tetracyclines were the first antibiotics to be investigated for this purpose, and various clinical investigations on periodontal disease have assessed their effectiveness. They

have been included into a number of delivery systems, including ethyl cellulose, hollow fibers, and ethylene vinyl acetate copolymer fibers, collagen preparations, and acrylic strips [4].

To alleviate the adverse effects associated with these drugs, studies are investigating the potential therapeutic applications of natural compounds such as Turmeric, Aloe, Neem, Tulsi, Cork bark, and Pomegranate. Natural products pave the way for true and healthy healing. One such natural plant that has gained medicinal recognition in recent times is Curcumin (CU) [5].

CU has been extensively studied in literature for its anti - inflammatory, antioxidant, antibacterial, and wound healing properties, making it a highly effective agent for use as a subgingival irrigant, gel, film, or chip. Its therapeutic application has been observed in a variety of conditions, though only a few studies have analysed the efficacy of CU as a local drug delivery agent in the treatment of periodontitis ([6]. To the best of our knowledge, this is the first study aimed to evaluate the effectiveness of curcumin chip as a local drug delivery and compare it to tetracycline fibres, which is currently being used to manage periodontal pocket.

2. Materials and Methodology

The randomized 3 - month clinical trial was conducted at the Department of Periodontology, SRM Kattankulathur Dental College and Hospital. Approval for the study was obtained from the institutional ethical committee (SRMIEC - ST0924 - 1456), and the study was carried out over a 4 month period.

All patients provided informed consent. The selection criteria included individuals aged 30 to 50 who were systemically healthy and had a pocket depth of ≥5 mm, as measured by the UNC - 15 Probe. Exclusion criteria included smoking or any form of tobacco use, medications that affect periodontal treatment or blood coagulation, the use of antibiotics or anti - inflammatory drugs within 3 months prior to the study, use of mouthwash or plaque control agents, diabetic or immunocompromised patients, tobacco or alcohol users, individuals with drug allergies, and pregnant or lactating women.

Total of fifteen patients (9 males and 6 females) with 45 sites each comprising 3 test sites with localised chronic periodontitis were selected, Diagnosis of periodontal disease was based 2017 classification. To ensure homogeneity among study locations, the first and second molars of maxillary arch and mandibular arch are selected [7].

The study design is described using a flowchart. Clinical parameters that were evaluated included the following: Probing pocket depth (PPD), gingival index (GI) (Loe and Silness 1963), bleeding on probing (BOP), plaque index (PI) (Silness and Loe 1964), and clinical attachment level (CAL).

Using a graduated periodontal probe (PCP UNC 15, Hu - Friedy® Manufacturing Co., Chicago, IL, USA), probing pocket depth (PPD) was measured. After inserting the probe into the gingival sulcus, measurements were obtained from the base of the pocket to the gingival margin. Customized acrylic stents were made from alginate impressions, which were then employed as reference materials at the experimental sites to measure PPD and Clinical Attachment Level (CAL). A solitary researcher carried out all baseline, one - month, and three - month measurements [8].

To eliminate supra - gingival plaque, oral prophylaxis was carried out with ultrasonic scalers. The local drug delivery (LDD) was preceded by Gracey curettes root planning of the two test sites and the control site. A follow - up visit was scheduled for one month and three months after the initial visit, at which time clinical parameters were noted.

Tetracycline fibers available as 2mg of tetracyclin impregated in 25mg of collagen fibers was used (PerioPlus AB, Advanced Biotect Product, Chennai, India) was used.

Preparation of 5% curcumin chip

The formulation was done at SRM College of Pharmacy, Potheri, Chennai. Hydrolysed collagen (HealthyHey Pure Hydrolysed Collagen) and chitosan (BFCLAB chitosan 10 g powder) were mixed to form a gel base. The mixture of hydrolysed collagen and chitosan is then added with polyvinyl alcohol to make it soluble in the liquid form to make a gel base. Gel - based mixtures containing all three components are poured into the plates for drying. After it had been dried, 5 g of ethanolic extract of 5% Curcumin prepared from curcumin powder (Sigma - Aldrich. Co, St. Louis, USA) was added to the dried film in plates and allowed to dry at room temperature. After thorough drying, the sheets were cut into uniform rectangular chips measuring 4 mm by 5 mm, each with one rounded end, giving them a U - shaped appearance (Figure - 1). These chips were then packed and sent for gamma radiation [9, 10].

Figure 1: Curcumin chip

Administration:

In order to ensure that the curcumin chip rested subgingivally, its round end was inserted straight into the base of the periodontal pocket and pressed apically. After soaking, tetracycline fibers were gently pushed into the pocket's base with a straight probe to fill the pocket's depths (Figure - 2). The gingiva was meticulously adjusted to seal the gingival margin's entrance after insertion. To aid in the initial setting of the material and encourage hemostasis, hand pressure was used for a few minutes. Coe - Pak was then used to seal the gingival margin, preventing the drug from dislodgment and obstructing the passage of oral fluids. A follow - up appointment was set up for seven days later to remove the Coe - Pak and evaluate any indications of an inflammatory reaction. Patients were advised to avoid chewing hard, crunchy, or sticky foods for at least one week. Additionally, patients should refrain from brushing or flossing the treated area, avoid disturbing it with the tongue, fingers, or toothpicks, and report any dislodgement of the material, or

any pain, swelling, or other issues that arise before the next scheduled visit [3].

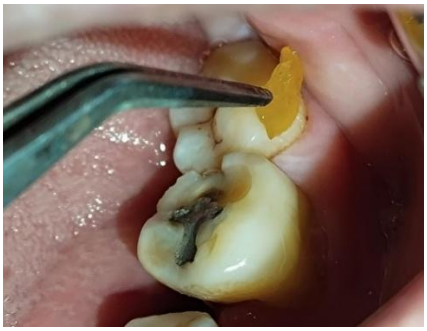

Figure 2: Placement of curcumin chip

Statistical Analysis

Data were analyzed using IBM SPSS version 20 software (IBM SPSS, IBM Corp., Armonk, NY, USA). Descriptive statistics, one way analysis of variance, repeated measures analysis of variance were done to analyze the study data.

3. Results

The study included 15 patients, 9 Males, and 6 Females (ranging from 30 to 50 years old)

Table 1 shows the inter - group comparison of the study parameters at baseline. No significant differences in the study parameters were found at baseline between the groups.

Table 1: Inter - group comparison of study parameters at baseline.

Parameter	Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		F value	P value
						Lower Bound	Upper Bound		
PPD	SRP+Curcumin	15	6.33	0.900	0.232	5.84	6.83	0.188	0.829
	SRP+Tetracycline	15	6.40	0.986	0.254	5.85	6.95		
	SRP	15	6.53	0.834	0.215	6.07	7.00		
CAL	SRP+Curcumin	15	3.27	0.799	0.206	2.82	3.71	0.736	0.485
	SRP+Tetracycline	15	3.40	0.986	0.254	2.85	3.95		
	SRP	15	3.73	1.387	0.358	2.97	4.50		
PI	SRP+Curcumin	15	2.2167	0.29681	0.07664	2.0523	2.3810	0.048	0.953
	SRP+Tetracycline	15	2.2500	0.37796	0.09759	2.0407	2.4593		
	SRP	15	2.2167	0.33894	0.08751	2.0290	2.4044		
GI	SRP+Curcumin	15	2.2667	0.31997	0.08262	2.0895	2.4439	0.06	0.942
	SRP+Tetracycline	15	2.3000	0.30178	0.07792	2.1329	2.4671		
	SRP	15	2.2667	0.29073	0.07507	2.1057	2.4277		

One way analysis of variance; $p \leq 0.05$considered statistically significant

Table 2 shows the inter - group comparison of study parameters at 1 month and 3 months. Significant differences were found in PPD and CAL between the study groups at 3 months follow - up. In post - hoc comparisons, it was noted that the SRP group had significantly higher mean PPD and mean CAL values than the SRP + Curcumin and SRP + Tetracycline groups. No significant differences in Plaque Index (PI) and Gingival Index (GI) scores were observed between the groups at both the 1 - month and 3 - month evaluation periods.

Table 2: Inter - group comparison of study parameters at 1 month and 3 months

Parameter	Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		F value	P value
						Lower Bound	Upper Bound		
PPD 1 month	SRP+Curcumin	15	4.53	0.743	0.192	4.12	4.94	0.851	0.434
	SRP+Tetracycline	15	4.93	0.799	0.206	4.49	5.38		
	SRP	15	4.73	0.961	0.248	4.20	5.27		
PPD 3 months	SRP+Curcumin	15	3.47	0.743	0.192	3.06	3.88	8.306	0.001*
	SRP+Tetracycline	15	3.80	0.862	0.223	3.32	4.28		
	SRP	15	4.60	0.737	0.190	4.19	5.01		
CAL 1 month	SRP+Curcumin	15	1.87	0.743	0.192	1.46	2.28	0.221	0.803
	SRP+Tetracycline	15	1.93	0.799	0.206	1.49	2.38		
	SRP	15	1.73	0.961	0.248	1.20	2.27		
CAL 3 months	SRP+Curcumin	15	0.60	0.737	0.190	0.19	1.01	7.475	0.002*
	SRP+Tetracycline	15	0.80	0.775	0.200	0.37	1.23		
	SRP	15	1.60	0.737	0.190	1.19	2.01		
PI 1 month	SRP+Curcumin	15	1.0333	0.42117	0.10874	0.8001	1.2666	0.024	0.976
	SRP+Tetracycline	15	1.0500	0.44521	0.11495	0.8034	1.2966		
	SRP	15	1.0667	0.37161	0.09595	0.8609	1.2725		
PI 3 months	SRP+Curcumin	15	1.0833	0.36187	0.09344	0.8829	1.2837	0.009	0.991
	SRP+Tetracycline	15	1.0967	0.43403	0.11207	0.8563	1.3370		
	SRP	15	1.1000	0.24640	0.06362	0.9635	1.2365		
GI 1 month	SRP+Curcumin	15	0.6667	0.30861	0.07968	0.4958	0.8376	1.028	0.367
	SRP+Tetracycline	15	0.8000	0.30178	0.07792	0.6329	0.9671		
	SRP	15	0.8000	0.27058	0.06986	0.6502	0.9498		
GI 3 months	SRP+Curcumin	15	0.3167	0.25820	0.06667	0.1737	0.4597	1.762	0.184
	SRP+Tetracycline	15	0.4167	0.24398	0.06299	0.2816	0.5518		
	SRP	15	0.5167	0.35940	0.09280	0.3176	0.7157		

One way analysis of variance; p≤0.05considered statistically significant; * denotes significance; groups with the same superscript depicted at the mean values represent significant differences in post - hoc tests.

Table 3 shows the intra - group comparison of PPD and CAL. In all the three groups, significant improvement in PPD and CAL were noted from baseline to 3 months. The table compares the effects of SRP with adjuncts (Curcumin or Tetracycline) on Probing Pocket Depth (PPD) and Clinical Attachment Level (CAL) over three time points. At baseline, all groups had similar values. Significant improvements in PPD and CAL were observed at 1 and 3 months ($P < 0.001$). The SRP + Curcumin group showed the most pronounced reductions in PPD and CAL at 3 months, followed by SRP + Tetracycline, with SRP alone being less effective.

Table 3: Intra - group comparison of PPD and CAL

Parameter	Group	Time point	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		F value	P value
							Lower Bound	Upper Bound		
PPD	SRP + Curcumin	Baseline	15	6.33	0.900	0.232	5.84	6.83	138.72	<0.001*
		1 month	15	4.53	0.743	0.192	4.12	4.94		
		3 months	15	3.47	0.743	0.192	3.06	3.88		
	SRP + Tetracycline	Baseline	15	6.40	0.986	0.254	5.85	6.95	101.63	<0.001*
		1 month	15	4.93	0.799	0.206	4.49	5.38		
		3 months	15	3.80	0.862	0.223	3.32	4.28		
	SRP	Baseline	15	6.53	0.834	0.215	6.07	7.00	63.68	<0.001*
		1 month	15	4.73	0.961	0.248	4.20	5.27		
		3 months	15	4.60	0.737	0.190	4.19	5.01		
CAL	SRP + Curcumin	Baseline	15	3.27	0.799	0.206	2.82	3.71	112.84	<0.001*
		1 month	15	1.87	0.743	0.192	1.46	2.28		
		3 months	15	0.60	0.737	0.190	0.19	1.01		
	SRP + Tetracycline	Baseline	15	3.40	0.986	0.254	2.85	3.95	101.63	<0.001*
		1 month	15	1.93	0.799	0.206	1.49	2.38		
		3 months	15	0.80	0.775	0.200	0.37	1.23		
	SRP	Baseline	15	3.73	1.387	0.358	2.97	4.50	30.26	<0.001*
		1 month	15	1.73	0.961	0.248	1.20	2.27		
		3 months	15	1.60	0.737	0.190	1.19	2.01		

Repeated measures analysis of variance; p≤0.05 considered statistically significant; * denotes significance

Table 4 shows the intra - group comparison of PI and GI. In all the three groups, significant improvement in PI and GI were noted from baseline to 3 months. GI scores were also comparable across groups at baseline, with SRP + Curcumin (2.2667), SRP + Tetracycline (2.3000), and SRP alone (2.2667). This confirms similar initial levels of gingival inflammation across all groups. The SRP + Curcumin, SRP + Tetracycline groups and SRP group showed identical scores. Marked reductions in GI were observed at 1 month in all groups. Further improvement was seen at 3 months, with the SRP + Curcumin group showing the lowest GI score (0.3167), followed by SRP + Tetracycline (0.4167), and SRP alone (0.5167).

PI scores show significant variation from baseline to 3 months

Table 4: Intra - group comparison of PI and GI scores.

Parameter	Group	Time point	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		F value	P value
							Lower Bound	Upper Bound		
PI	SRP + Curcumin	Baseline	15	2.2167	0.29681	0.07664	2.0523	2.3810	91.14	<0.001*
		1 month	15	1.0333	0.42117	0.10874	0.8001	1.2666		
		3 months	15	1.0833	0.36187	0.09344	0.8829	1.2837		
	SRP + Tetracycline	Baseline	15	2.2500	0.37796	0.09759	2.0407	2.4593	60.208	<0.001*
		1 month	15	1.0500	0.44521	0.11495	0.8034	1.2966		
		3 months	15	1.0967	0.43403	0.11207	0.8563	1.3370		
	SRP	Baseline	15	2.2167	0.33894	0.08751	2.0290	2.4044	136.95	<0.001*
		1 month	15	1.0667	0.37161	0.09595	0.8609	1.2725		
		3 months	15	1.1000	0.24640	0.06362	0.9635	1.2365		
GI	SRP + Curcumin	Baseline	15	2.2667	0.31997	0.08262	2.0895	2.4439	342.604	<0.001*
		1 month	15	0.6667	0.30861	0.07968	0.4958	0.8376		
		3 months	15	0.3167	0.25820	0.06667	0.1737	0.4597		
	SRP + Tetracycline	Baseline	15	2.3000	0.30178	0.07792	2.1329	2.4671	347.53	<0.001*
		1 month	15	0.8000	0.30178	0.07792	0.6329	0.9671		
		3 months	15	0.4167	0.24398	0.06299	0.2816	0.5518		
	SRP	Baseline	15	2.2667	0.29073	0.07507	2.1057	2.4277	198.81	<0.001*
		1 month	15	0.8000	0.27058	0.06986	0.6502	0.9498		
		3 months	15	0.5167	0.35940	0.09280	0.3176	0.7157		

Repeated measures analysis of variance; p≤0.05 considered statistically significant; * denotes significance

Table 5: Inter - group comparison of the magnitude of change in study parameters from baseline to 3 months. With regard to the magnitude of change from baseline to 3 months, significant difference between the study groups was noted only in the PPD values with SRP + Curcumin group demonstrating the highest reduction the mean PPD followed by SRP + Tetracycline and SRP alone. In post - hoc pairwise comparisons it was noted that the difference between SRP + Curcumin and SRP groups was statistically significant while there was no significant difference between the other two pairs.

Parameter	Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		F value	P value
						Lower Bound	Upper Bound		
PPD	SRP+Curcumin	15	2.87	0.834	0.215	2.40	3.33	6.00	0.005*
	SRP+Tetracycline	15	2.60	0.828	0.214	2.14	3.06		
	SRP	15	1.93	0.594	0.153	1.60	2.26		
CAL	SRP+Curcumin	15	2.67	0.816	0.211	2.21	3.12	1.376	0.264
	SRP+Tetracycline	15	2.60	0.828	0.214	2.14	3.06		
	SRP	15	2.13	1.187	0.307	1.48	2.79		
PI	SRP+Curcumin	15	1.1333	0.35187	0.09085	0.9385	1.3282	0.03	0.971
	SRP+Tetracycline	15	1.1533	0.54362	0.14036	0.8523	1.4544		
	SRP	15	1.1167	0.29681	0.07664	0.9523	1.2810		
GI	SRP+Curcumin	15	1.9500	0.31623	0.08165	1.7749	2.1251	1.242	0.299
	SRP+Tetracycline	15	1.8833	0.31149	0.08043	1.7108	2.0558		
	SRP	15	1.7500	0.42258	0.10911	1.5160	1.9840		

One way analysis of variance; p≤0.05considered statistically significant; * denotes significance; groups with the same superscript depicted at the mean values represent significant differences in post - hoc tests

4. Discussion

The primary aim of periodontal therapy is to eliminate bacterial plaque and the contributing factors that facilitate its accumulation. Despite scaling and root planing (SRP) being the conventional treatment modality, the Concurrent local drug delivery administration is linked to better periodontal tissue health, including reduced systemic side effects, decreased drug resistance, and increased drug penetration in diseased sites, which eliminates harmful pathogenic bacteria.

Tetracycline fibers have demonstrated exceptional effectiveness among locally delivered drugs (LDD). Its newly identified characteristics include anti - inflammatory effects, inhibition of bone resorption, and anti - collagenase effect. These attributes make tetracycline highly effective for various treatments, showcasing its potential beyond traditional uses. Due to these benefits, tetracycline fibers are considered one test group in our study. However, drawbacks such as potential antibiotic resistance and adverse side effects exist. To address these concerns, herbal alternatives like curcumin, also being explored in our research.

Over the decades, the use of natural herbal products in dentistry has grown steadily. This is explained by their intrinsic availability, low cost, and minimal adverse effects. One of these herbal products is curcumin, which has been shown to have antiseptic, anti - inflammatory, antimicrobial, and antioxidant qualities. Throughout the course of the study, no adverse effects were noted. The purpose of this study is to evaluate the effectiveness of using curcumin chips, a natural herbal product, for local drug delivery in the treatment of stage II grade A Periodontitis [(11).]

The diagnosis of periodontal disease traditionally relies on parameters such as plaque index, gingival index, probing pocket depth, and clinical attachment loss which were evaluated in our study. The data in the present investigation align with the clinical findings of most studies on scaling and root planing (SRP), demonstrating a positive response in the majority of cases.

Our study at baseline showed, no significant differences in periodontal parameters among the study groups, ensuring comparable initial conditions for all participants. This established a solid foundation for evaluating the true effects of the treatments without baseline disparities influencing the outcomes. Significant improvements in Probing Pocket Depth (PPD) and Clinical Attachment Level (CAL) were observed at the 3 - month follow - up, especially in the SRP + Curcumin and SRP + Tetracycline groups, aligning with findings by Saini et al. and Sachdeva et al [(10, 12).] This suggests that both Curcumin and Tetracycline, when used as adjuncts to SRP, provide superior outcomes in reducing pocket depth and improving attachment levels compared to SRP alone.

Similarly, significant improvements in Plaque Index (PI) and Gingival Index (GI) were noted in all three groups from baseline to 3 months. This confirms the overall efficacy of SRP in controlling plaque accumulation and reducing gingival inflammation across all treatment modalities. However, a study by Gottumukkala et al [(13)] indicated no significant differences in PI and GI scores between groups at both the 1 - month and 3 - month time points, suggesting that while SRP, whether used alone or with adjuncts, is effective in managing plaque and gingival inflammation, the adjunctive treatments do not confer additional benefits in these specific parameters.

These results are consistent with other studies. For instance, Cugini et al [(14)] demonstrated that SRP significantly reduces PI and GI, highlighting its effectiveness in managing plaque and gingival health. The study by Haffajee et al. also supports our findings, indicating that mechanical debridement alone is highly effective in reducing clinical indicators of periodontal disease, even when adjunctive treatments are not used.

Furthermore, Behal et al [(15)] evaluated the effects of curcumin gel as an adjunct to SRP and found significant improvements in clinical periodontal parameters from baseline to 30 days in both test and control sites. This aligns with the findings of our study, suggesting that curcumin has potential as an effective adjunctive therapy in periodontal treatment. Similarly, Bhatia

et al. ([16]) reported that adjunctive use of herbal extracts, including curcumin, resulted in significant improvements in periodontal health, further corroborating the efficacy of such adjunctive therapies.

The data from these studies underscore the importance of SRP as a foundational treatment for periodontal disease. The addition of adjunctive therapies, such as curcumin and tetracycline, appears to enhance the clinical outcomes, particularly in terms of PPD and CAL. However, the impact on PI and GI may be less pronounced, suggesting that the primary benefits of adjunctive treatments are related to deeper periodontal structures rather than surface - level plaque and gingival inflammation.

When examining the magnitude of change from baseline to 3 months, a significant difference was observed only in PPD values. The SRP + Curcumin group demonstrated the highest reduction in mean PPD, followed by the SRP + Tetracycline group, and lastly, the SRP alone group. This suggests that Curcumin as an adjunctive treatment provides the most substantial improvement in reducing periodontal pocket depths.

Our findings align with those of Behal et al. who also reported significant improvements in PPD and other clinical parameters when using curcumin as an adjunct to SRP. Based on our study, it can be concluded that all four treatment modalities led to substantial improvements in clinical parameters such as plaque index, gingival index, probing pocket depth, and clinical attachment level. Notably, the greatest reduction in PPD was observed in the group treated with SRP combined with the Curcumin chip, reinforcing Curcumin's potential as an effective adjunctive therapy.

The potential efficacy of curcumin is demonstrated by the notable change in both clinical parameters within a short duration of one month of the curcumin chips placement as an adjunct to SRP when compared to control groups. It is more suitable as a topical medicine rather than for oral consumption due to its plasma half - life of approximately 6.77 hours after ingesting 10 - 12 mg of curcumin orally. Overall, the evidence supports the use of adjunctive therapies in conjunction with SRP for comprehensive periodontal care. While SRP alone is effective in managing periodontal disease, the inclusion of adjunctive treatments like curcumin and tetracycline can provide additional benefits, particularly in reducing pocket depth and improving attachment levels.

However, it is important to acknowledge some limitations of the present study, including the short study period and the small study population, which may limit the generalizability of the findings. Additionally, no microbiological investigations were conducted to evaluate the antimicrobial effects of the different treatment groups. Despite these limitations, the study suggests that a holistic approach to periodontal treatment, incorporating adjunctive therapies, can lead to better long - term outcomes and improved oral health for patients.

5. Conclusion

The study indicates the effectiveness of Curcumin and Tetracycline as adjuncts to scaling and root planing (SRP) in periodontal therapy. Both significantly improve clinical outcomes by reducing probing pocket depth (PPD) and enhancing clinical attachment level (CAL), with Curcumin demonstrating the greatest PPD reduction. Improvements in plaque index (PI) and gingival index (GI) across all groups reinforce SRP as a fundamental treatment. Curcumin's potent anti - inflammatory and antimicrobial properties make it a promising, biocompatible adjunctive option. These findings highlight the benefit of incorporating adjunctive agents like Curcumin to optimize periodontal inflammation control and tissue repair.

References

[1] Prakash S, Shivanand P, Vandana KV, et al.: Evaluation of curcumin 10 mg (Curenext®) as local drug delivery adjunct in the treatment of chronic periodontitis: A clinical trial. CODS - Journal of Dentistry.2018, 2: 59 - 63. 10.5005/jp - journals - 10063 - 0014.

[2] Surekha Rathod SR, Priya Mehta PM, Trupti Sarda TS, et al.: Clinical efficacy of Aloe vera chip as an adjunct to nonsurgical therapy in the treatment of chronic periodontitis. International Journal of Research in Ayurveda and Pharmacy.2015, 6: 516 - 519. 10.7897/2277 - 4343.06498

[3] Udhya AS, Vivekanandan G, Elangovan GP, et al.: Efficacy of Locally Delivered Herbal Chip Containing (8% Mimusops elengi) as an Adjunct to Scaling and Root Planing in Chronic Periodontitis: A Randomised split mouth clinical study. Advances in Human Biology.2024, 14: 357 - 361. 10.4103/aihb. aihb_33_24

[4] Reddy S, Bhowmick N, Singh S et al.: A comparison of Chlorhexidine and Tetracycline local drug delivery systems in management of persistent periodontal pockets - A clinical study. Int. J. Appl. Dent. Sci.2016; 2: 11 - 15. **https: //www.oraljournal. com/archives/2016/2/3/A/2 - 4 - 41**

[5] Medaiah S, Srinivas M, Melath A et al.: Chlorhexidine chip in the treatment of chronic periodontitis–a clinical study. Journal of clinical and diagnostic research: JCDR.2014, 8: 22 - 25.10.7860/JCDR/2014/8808.4477

[6] Bhatia M, Urolagin SS, Pentyala KB et al.: Novel therapeutic approach for the treatment of periodontitis by curcumin. Journal of clinical and diagnostic research: JCDR.2014; 8: 65 - 69. 10.7860/JCDR/2014/8231.5343

[7] Agrawal A, Sharma AR, Rathod V et al.: Assessment of the Efficiency of Tulsi Extract as a Locally Administered Medication Agent and Its Comparison With Curcumin in the Treatment of Periodontal Pockets. Cureus.2024, 16. 10.7759/cureus.54619

[8] Abhilasha Singh AS, Raja Sridhar MD, Ravi Shrihatti MD et al.: Evaluation of turmeric chip compared with chlorhexidine chip as a local drug delivery agent in the treatment of chronic periodontitis: a split mouth randomized controlled clinical trial. J Altern Complement Med.2018, 24: 76 - 84. 10.1089/acm.2017.0059

[9] Saini K, Chopra P, Bhardwaj A et al.: Comparative clinical evaluation of two local drug delivery agents (neem chip and turmeric chip) in chronic periodontitis: An experimental study. World Journal of Dentistry.2021, 12: 138 - 143. 10.5005/JP - JOURNALS - 10015 - 1818
[10] Elavarasu S, Suthanthiran T, Thangavelu A et al.: Evaluation of superoxide dismutase levels in local drug delivery system containing 0.2% curcumin strip as an adjunct to scaling and root planing in chronic periodontitis: A clinical and biochemical study. Journal of Pharmacy and Bioallied Sciences.2016, 8: 48 - 52. 10.4103/0975 - 7406.191967
[11] Sachdeva S, Agarwal V.: Evaluation of commercially available biodegradable tetracycline fiber therapy in chronic periodontitis. Journal of Indian Society of Periodontology.2011, 15: 130 - 134. DOI: 10.4103/0972 - 124X.84381
[12] Gottumukkala SNVS, Sudhakar U, Chandrasekhar P et al.: Evaluation of the Effectiveness of a Herbal Extract Used as an Adjunct to Scaling and Root Planing: A Clinical and Microbiological Study. Journal of Indian Society of Periodontology.
[13] Cugini MA, Haffajee AD, Smith C et al.: The effect of scaling and root planing on the clinical and microbiological parameters of periodontal diseases: 12 - month results. Journal of Clinical Periodontology.2000, 27: 30 - 36. https: //doi. org/10.1034/j.1600 - 051x.2000.027001030. x
[14] Behal R, Mali AM, Gilda SS et al.: Evaluation of local drug delivery of 2% whole turmeric gel used as an adjunct to scaling and root planing in chronic periodontitis: A clinical and microbiological study. Journal of Indian Society of Periodontology.2011, 15: 35 - 38 https: //doi. org/10.4103/0972 - 124x.82264
[15] Bhatia M, Udaykumar P, Sharma R et al. Clinical evaluation of the effects of curcumin and honey on periodontal health: A comparative study. Journal of Contemporary Dental Practice.2016, 17: 720 - 724.